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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/692,136
Filing Date: October 23, 2003
Appellant(s): WHITE ET AL.

MAILED
APR 02 2007
Group 3700

Geoffrey P. Shipsides
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 01/31/07 appealing from the Office action mailed 10/11/06:

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,018,274	*TROTTA*	*5-1991*
DE 3526951 A1	*ERDMANN et al*	*1-1987*
5,842,387	*MARCUS et al*	*12-1998*

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 17, 18, 20-22, 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trotta (5,018,274) in view of Erdmann et al (DE3526951A1), hereafter Erdmann. Trotta discloses the end product of a cutting element 14 for a safety razor blade unit in figures 1-4 and a method of making it in column 3, lines 36-42. Note in Trotta wafer P; surface/surface plane 24; acute/sharp cutting edge 30; guard element 21; intermediate transverse element juxtaposed surface 21 and element 18 in figure 4; interconnecting elements juxtaposed surfaces 22, 23 and elements 18 in figure 3; plurality of planar cutting elements 30 shown in figures 3 and 4; three planar cutting elements shown in figures 3 and 4; silicon in column 2, line 16. Trotta does not disclose a method of making which uses an etching process. However, Erdmann teaches a method of making a cutting element 9, 12 from a wafer of single crystal material with an etching process as shown in figure 1a. It would have been obvious to provide an etching process for making a cutting element from a wafer of single crystal material in Trotta as taught by Erdmann in order to reduce the number of mechanical steps in the process. Note in Erdmann anisotropic wet chemical etching and wet etching are shown in figure 1a) by the KOH.

Claims 19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Trotta and Erdmann as applied to claims 17, 18, 20-22, 24 and 26 above, and further in view of appellant's admitted prior art (APA). In the appellant's specification on pages 3-4, lines 30-23, respectively, the appellant admits that dry etching and isotropic etching are well known. It would have been obvious to use dry etching in the combination as taught by APA in order to remove the layers of silicon at a more uniform rate. It would have

been obvious to use isotropic etching in the combination as taught by APA in order to etch the silicon wafer faster.

Claims 17-24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trotta (5,018,274) in view of Marcus et al (5,842,387), hereafter Marcus. Trotta discloses the end product of a cutting element 14 for a safety razor blade unit in figures 1-4 and a method of making it in column 3, lines 36-42. Note in Trotta wafer P; surface/surface plane 24; acute/sharp cutting edge 30; guard element 21; intermediate transverse element juxtaposed surface 21 and element 18 in figure 4; interconnecting elements juxtaposed surfaces 22, 23 and elements 18 in figure 3; plurality of planar cutting elements 30 shown in figures 3 and 4; three planar cutting elements shown in figures 3 and 4; silicon in column 2, line 16. Trotta does not disclose a method of making which uses an etching process. However, Marcus teaches a method of making a cutting element as shown in figure 33 from a wafer of single crystal material with an etching process as described in column 3, lines 54-65. It would have been obvious to provide an etching process for making a cutting element from a wafer of single crystal material in Marcus as taught by Erdmann in order to achieve an exceptionally sharp edge. Note in Marcus, anisotropic wet chemical etching and wet etching in column 4, lines 13-32; dry etching in column 4, line 38; isotropic etching in column 4, lines 37-38.

(10) Response to Argument

Appellant asserts that Trotta does not explicitly disclose a guard element, and does not disclose a guard element formed by an etching process. In the appellant's specification on page 7, lines 5-7, the appellant described the guard element as being parallel to the blades and lying between the first blade 11 and the guard member 3 of the frame in the assembled blade unit.

Trotta discloses the guard element precisely as it was described in appellant's specification. Trotta discloses a guard element 21which is parallel to the blades 30 and lies between the first blade 30, which is juxtaposed element 18, and the guard member, wherein the guard member in figure 1 of Trotta is shown in the form of a cylindrical member. Moreover, Trotta does not disclose that the guard element is formed by an etching process because the etching process is taught by Erdmann.

Appellant asserts that the cutting edges 12 of Erdmann are not positioned at the surface plane of Erdmann's blade, however, Erdmann was not used in the rejection to teach a surface plane because the surface plane is disclosed in Trotta as being coplanar with the surface 24. Erdmann teaches an etching process for making sharp cutting edges in order to improve cutting quality and a longer life expectancy of the blade. Erdmann teaches an improved process which is superior to the grinding and polishing process disclosed in Trotta.

Appellant asserts that there is no teaching or suggestion to combine Erdmann and Trotta, and that the combination is derived from hindsight reconstruction. However, in the English translation of Erdmann on page 2, 10 lines from the bottom of the page, Erdmann declares, "the objective of the invention is to create a shearing blade with improved cutting quality and a longer life expectancy [of the blade]." This sentence would motivate a person of ordinary skill in the art to replace the process described by Trotta with the etching process taught by Erdmann.

Appellant asserts that the shearing blades in Erdmann are intended for use in electric shavers, and therefore the references cannot be combined. Moreover, appellant states that electric shavers do not have sharp cutting edges as was defined in claim 17. The references are combinable because both Erdmann and Trotta disclose devices which have cutting edges for

cutting hair from a user's skin. Also, cutting edges are always "sharp". If the edge of the razor in Erdmann was not "sharp" it would not cut any hair. And even though there are shearing blades which may have a rectangular configuration, and the cutting is caused by the shearing action of the two rectangular shearing blades, this is not the case with Erdmann. Erdmann clearly shows a cutting edge 12 in figures 1b) and 1c), which has two surfaces that meet at an apex, wherein a cutting edge is formed along that apex. The appellant's own "sharp" cutting edges are formed with this identical structure. If the appellants structure of the "sharp" cutting edge, as shown in figures 3 and 4, is identical to Erdmann, it is determined that this structure defines the term "sharp"; therefore, Erdmann discloses a "sharp" cutting edge.

Furthermore, appellant asserts that Erdmann provides no suggestion that an etching process could produce the angled honeycomb structure of Trotta, particularly the angled cutting blades 30 shown in figure 4. Erdmann does provide a suggestion that an etching process could produce the angled honeycomb structure of Trotta, particularly the angled cutting blades 30 shown in figure 4. This is shown in figure 1(a) of Erdmann. One of ordinary skill in the art would be able to make the honeycomb structure of Trotta as suggested by Erdmann by only applying the photoresist 3 on the top surface of silicon disk 1 to the left of direction 6 as shown in figure 1(a) of Erdmann (as shown, the photoresist 3 is applied slightly to the right of direction 6 in figure 1(a)), and applying photoresist 3 to the right of direction 8, which is currently shown with no photoresist in figure 1(a), then etched with KOH on the top and bottom surfaces of disk 1. The resultant structure would produce the honeycomb structure of Trotta, particularly the cutting blades 30 shown in figure 4, because the material between directions 6 and 8 would be etched away in Erdmann leaving the honeycomb structure.

Appellant asserts that Trotta does not provide a wafer of a single crystal material having a surface lying in a predetermined plane of the crystallographic structure. It is believed that Trotta does not have this element, however, the rejection states that Erdmann teaches a wafer of a single crystal material having a surface lying in a predetermined plane of the crystallographic structure in column 2, line 16, and in column 3, line 19. Appellant asserts that the blades in the references and the blades in the instant application are different due to use with different technology, however, it is believed that all of the references use similar technology due to the common purpose of hair removal with a sharp edge. Appellant asserts that the anisotropic etching process of Erdmann cannot produce cutting edges at the surface plane of Trotta. It is believed that the process in Erdmann can be used to create a surface plane with cutting edges at the surface plane in Trotta because the wafer in Trotta can uniformly be etched away in order to create a planar wafer similar to the section on the right of figure 1c) in Erdmann.

In the declaration of Uwe Sievers, the comparison between Erdmann and a pair of scissors is explained. Since the etched "foil" in Erdmann is designed to be used with an underlying shearing knife, Uwe Sievers asserts that using such a foil on a wet shaving razor blade, such as Trotta's, would not cut hair from a user's skin. However, it is believed that the combination would allow a user to shave because if a user replaced his wet shaving razor blade with one blade from the blades of a scissors, then it would cut hair from the user's face. Although Uwe Sievers asserts that some scissors are blunt, there are also scissors which are quite sharp. Moreover, wet shaving razor blades do depend on some amount of shearing due to the resistance of the hair being rooted into the skin. The root of the hair provides an opposite force to the wet shaving razor blade as it glides over the skin. If the root of the hair and the skin did

not provide some amount of opposite or "shearing" force to the hair, the hair would simply be pushed along and never cut.

Appellant asserts that Marcus cannot be combined with Trotta in order to create a sharp cutting edge at the surface plane of a blade for wet shaving. Marcus discloses using etching in order to create a sharp cutting edge for a knife blade. Since the techniques in Marcus are able to produce sharp edge used in surgical scalpels, the techniques of Marcus would clearly produce a sharp edge capable of being used in a blade for wet shaving in Trotta.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Isaac N. Hamilton

BOYER D. ASHLEY
SUPERVISORY PATENT EXAMINER

Conferees:

Mr. Ashley Boyer, SPE 3724

Mr. Joseph Hail, SPE 3723

Attachment: translation of Erdmann et al.

(19) FEDERAL REPUBLIC OF GERMANY
GERMAN PATENT AND TRADE MARK OFFICE

(12) Disclosure Certificate
(11) DE 35 26 951 A1

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(54) Shearing Blade for Razors and Method for the Production Thereof

The shearing blade consists of a silicon disk (1), having a monocrystalline structure into which square, rectangular or diamond-shaped holes (11), which serve as hair entry holes, are formed by means of anisotropic etching.

[PICTURE]

DE 35 26 951 A1

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Patent Claims

1. Shearing blade for razors, characterized by the fact that it consists of a monocrystalline and anisotropically etched silicon disk (1) for the formation of square, rectangular or diamond-shaped holes (11) serving as hair entry holes.
2. Method for the production of a shearing blade for razors, characterized by anisotropic etching of a silicon-pure crystalline disk (1) for the creation of a thin membrane by means of a hole pattern.
3. Method according to claim 2, characterized by the fact that, subject to the geometry and arrangement of the etching masks in local relation to the orientation of the crystal structure, both the form and the edge inclinations of the holes (11) of the hole pattern, serving as hair entry holes, are designed changeably.
4. Method according to claim 3, characterized by the fact that the orientation is made in such a way that the edges of the holes are built of (111) levels, which are minimally variable due to etching, so that without the corrosion of the external geometry of the hole pattern of the holes (11), the density of the shearing blade is determined by the duration of the etching whereby, simultaneously, the sharp cutting edges (12) of diamond-like abrasiveness are produced.
5. Method according to one of claims 2 to 4, characterized by the fact that the shearing blade edge and the fastening geometry of the shearing blade are produced from the same silicon disk (1).
6. Method according to one of claims 2 to 5, characterized by the fact that the silicon-pure crystalline disk shows a (110)-crystalline orientation whereby square or rectangular holes, serving as hair entry holes (11), are produced, the edges of which correspond with the basic direction allowed by the (110)-levels, which are limited through an etching front coming from the opposite side in the form of a frustum of a pyramid. In this way, the cutting edges (12) evolve and, at the same time, the shearing blade obtains the desired density (D), as well as the edge strengthening, and the fastening geometry of the shearing blade is produced.
7. Method according to one of claims 2 to 5, characterized by the fact that the silicon-pure crystalline disk (1) demonstrates a (110)-crystalline orientation, whereby diamond-shaped holes (11), serving as hair entry holes, are produced, which show angular shearing edges at the acute-angled corners and, for the rest, varying shearing edges (12) vertical to the disk surface (2).

Description

The invention relates to a shearing blade for razors and the method for the production thereof.
Shearing blades for razors, particularly electronic razors, are known. In the case of electronic razors, the shearing blade consists of a perforated nickel foil. The perforation has an excess length on the side that is turned towards the shearing knives, which serves as a cutting edge where the beard hair, for instance, is cut. The excess length tops off after a relatively short time of operation whereby the quality starts to fail.
Furthermore, the cutting and shaving quality is limited by the shearing blade density of approx. 50 µm in the case of shearing blades that are not worn out.
The objective of the invention is to create a shearing blade with improved cutting quality and a longer life expectancy.
This objective is met by the invention characterized in claim 1 and claim 2, respectively.
Advantageous embodiments of the invention are evident from the sub-claims.
Anisotropic etching techniques in connection with crystalline silicon are known. These are, for instance, applied in order to produce micromechanical components, such as trenches, holes, stand-alone tongues, etc., which are required for the creation of ultra-small sensors and actuators (see K.E. Petersen/SILICON AS A MECHANICAL MATERIAL/IEEE, Vol. 70, No. 5, MAY 1982).
The basic idea of the invention is to produce a hole pattern from a monocrystalline silicon disk by means of a single etching process, whereby customary silicon disks of the crystalline orientation (100), (110) are

used. Because of the choice of crystalline orientation, geometry, pattern and arrangement of the etching mask, both the form of the holes serving as beard entry holes, as well as the inclination of the cutting edges, are influenced.

In the case of customary silicon disks of the crystalline orientation (100), holes of rectangular or square profile can be manufactured. Due to the physical peculiarity of the etching process, the hole edges run towards each other in such a way that the hole narrows (e.g. in the case of square holes of the type of the frustum of a pyramid), whereby angular shearing edges of diamond-like quality are shaped on all four sides of the hole. With the customary silicon disks of the crystalline orientation (110), holes with a diamond-shaped profile emerge due to the etching process, whereby the profile hole does not change outside in the acute-angled corner of the diamond with increasing etching depth. Cutting edges running vertically towards the disk surface emerge through the etching process, whereas angular running cutting edges emerge at the acute-angled corners of the diamond-shaped holes by increasing etching depth.

Embodiments of the invention are displayed in the figure and are clarified in more detail as follows:

Fig. 1a – a sectional view of a monocrystalline (100) oriented silicon disk before etching;

Fig. 1b – a sectional view of a monocrystalline (100) oriented silicon disk after etching;

Fig. 1c – a perspective view of shearing blade manufacturing with the method according to the invention;

Fig. 2 – an overview of a monocrystalline (100) oriented silicon disk; and

Fig. 3 – a perspective view of a monocrystalline (110) oriented silicon disk with a diamond-shaped hole shaped therein.

The following section describes the manufacturing process for the production of shearing blades and, as a result thereof, a manufactured shearing blade. Fig. 3 shows a customary (100)-silicon disk, which is subjected to anisotropic etching for the production of a hole pattern. The hole profile is square in the displayed embodiment. It can also be rectangular or, as is clarified further on, diamond-shaped in form.

Due to the physical peculiarity of the etching process, the hole cards run in a pyramid shape towards each other. The holes narrow in the direction of the shaving knives and produce diagonal cutting edges of diamond-like quality. The simultaneous form etching of the shearing blade frame generates the shearing blade in the etching process.

Fig. 1 shows a non-full-scale depiction of the cut-out of the silicon disk 1 oriented in direction (100), the surfaces 2 of which is oxidized in a well-known way on SiO_2 with hot water vapor. Windows 4 and 5 are produced through the covering with positive photoresist 3, application of etch-masks, exposure, development and opening of the oxide film by means of retentive flow acid. In this case, window 4 corresponds with a hole serving as hair entry hole and window 5 to the backside of the later shearing blade, in other words, the side turned towards the shearing knives.

The window surfaces are made of pure silicon and are oriented on the (100)-silicon disk parallel to the (110)-levels. In the following main etching process of anisotropic etches, here for instance KOH, the windows offer the possibility of penetrating into the silicon until the (111)-levels are reached, and whereby the edges in displayed directions 6, 7, 8 are formed. After the desired shearing blade density D is reached, the etching process is interrupted, and the remaining photoresist is removed. Fig. 1b shows the same section of the silicon disk after etching. It shows a shearing blade part 9, a shearing blade edge 10, as well as hole 11, formed as a hair entry hole, with the resulting cutting edges 12.

Fig. 1c shows a larger portion of the shearing blade in spatial display. It is self-explanatory that the hole pattern can be arbitrarily moved, insofar as the basic directions of the edges of the holes allowed by the (110)-levels. Instead of the square holes, short slits can be advantageous as was mentioned earlier. The shearing blade edge 10, left in original disk strength for the purpose of strengthening, can be equipped with fastening holes and can be shaped, in an advantageous manner, by the same etching process.

A typical embodiment of the shearing blade is shown by the measurements in Fig. 2: density of the silicon disk W = 250 µ; shearing blade density D = 30 µ, width of hole serving as a hair entry hole A = 542 µ, cutting width B = 500 µ, base width a = 30 µ, base width x = 72.5 µ and share/cutting hole $K_{1/2}$ in percent = 32.7%.

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TRANSLATION
TEMPORARY.PDF

A new shearing blade of improved cutting quality is created with this invention. It has a longer life expectancy and prevents skin allergies and nickel allergies in an advantageous manner.

Number:	35 26 951
Int. Cl⁴:	B 26 B 19/04
Registr. Date:	July 27, 1985
Disclosure Date:	January 29, 1987

[PICTURES]

TRANSLEGAL, LLC

TRANSLATION
TEMPORARY.PDF

TRANSLATOR'S CERTIFICATE

I, Dorothea Lotter, do hereby certify that I am fluent in the German and English languages. I prepared the translation into English of the document referred to "temporary". It is true and accurate to the best of my ability.

5 August 2004

Dorothea Lotter / fd

Dorothea Lotter